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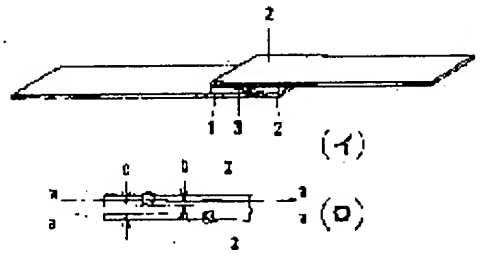
(54) THIN FILM TEMPERATURE FUSE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a thin film temperature fuse that ensures to cut off a current, and facilitates manufacturing.

SOLUTION: An insulating spacer strip 1 has its both sides with electrodes laid thereon. A fusible alloy strip 3 is arranged on the both sides with its end soldered to the end of the electrode.



LEGAL STATUS

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Notes:
1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]

[Claim 1] The thin temperature fuse characterized by for an electrode being laminated by both sides of a tabular insulation spacer, allotting the piece of a meltable alloy aslant to the end face of said spacer, and welding each end of the piece of a meltable alloy to the edge of each electrode.

[Claim 2] The thin temperature fuse according to claim 1 with which the full length or the welding part of each electrode edge neighborhood where each end of the piece of a meltable alloy is welded is projected rather than the end face of the tabular insulation spacer.

[Claim 3] The thin temperature fuse according to claim 1 with which the edge of each electrode with which each end of the piece of a meltable alloy is welded is cut except for the piece welding part of a meltable alloy.

[Claim 4] The thin temperature fuse according to claim 2 with which a piece-like projected part is prepared at the tip of a portion at which the electrode edge was projected, and this piece-like projected part is made into the meltable alloy one end welding part.

[Claim 5] The thin temperature fuse according to claim 3 with which welding of meltable alloy one end is performed by the piece-like projected part taken at the tabular insulation spacer end face.

[Claim 6] Claim 1, 3, or the thin temperature fuse given in five with which a crevice or notch **** is prepared in the tabular insulation spacer end face to which the piece of a meltable alloy is allotted.

[Claim 7] Claim 1 -6 for which the tip part of the band-like conductor is used as an electrode -- the thin temperature fuse of any or a description.

[Claim 8] an electrode is laminated by both sides of a tabular insulation spacer, and a hole can open in this layered product -- a hole -- the thin temperature fuse characterized by allotting the piece of a meltable alloy aslant to an inner circumference end face, and welding each end of

this piece of a meltable alloy to the hole inner circumference edge of each electrode.
[Claim 9] the Claims 1-8 which have the heating element which makes the piece of a meltable alloy blow out by energization generation of heat -- the thin temperature fuse of any or a description.

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a thin temperature fuse.
[0002]
[Description of the Prior Art] In the rechargeable battery used for the power supply of the portable type electric device, especially a rechargeable lithium-ion battery, since built-in energy is large, there is a danger of carrying out unusual generation of heat at the time of a short circuit etc., and exploding. When this danger is prevented to **** with a current fuse, since the current at the time of the abnormality is comparatively low, it has that quick current interception is [much] difficult, and it may use a temperature fuse for it. It ** and thin shape-ization of the temperature fuse is demanded with the miniaturization of a portable electric device, and the miniaturization of a rechargeable battery.
[0003] Conventionally, as a thin current fuse, as shown in (b) of drawing 15 , hole 5' is opened in tabular insulation spacer 1'. As both sides of tabular insulation spacer 1' are contacted through a hole in fuse element 3' and it is shown in (b) of what fixed electrode 2' and 2' to tabular insulation spacer both sides by adhesives 6' (JP,H6-333493,A), and drawing 15 Fuse element 3' is aslant allotted to the central space of annular insulation spacer 1'. While fixing electrode 2' and 2' to both sides of the spacer 1' with adhesives, what carried out the through drawer of the hole of each electrode 2' and 2', and welded each end of fuse element 3' (JP,S50-60530,U) is well-known.
[0004]
[Problem to be solved by the invention] [the blowout mechanism of the fuse element of a temperature fuse] Melting of the fuse element (piece of a meltable alloy) is carried out by unusual generation of heat of apparatus. Conglobulation division of the melting alloy is carried out by melting activation of flux, and wettability promotion operation, it is in the melting division alloy being solidified according to the shape of a surface of a sphere by the temperature fall of the apparatus by current interception, and, unlike a current fuse, melting scattering of the **-** element is not carried out. If the temperature fuse of the same composition is formally assumed to be the thin current fuse shown in **** at (b) and (b) of drawing 15 Since a division melting alloy will be hemispherical to the inside of electrode 2' and will be solidified as shown

in drawing 16 , if insulating spacer 1' is made not much thin, insulating gap c' will become small and positive energization interception will become difficult. With the composition which is (b) of drawing 15 , when the worst, a gap becomes zero and it becomes impossible to current intercept it. Therefore, it is necessary to make an insulating spacer quite thick, and disadvantageous for thin-shape-izing of a temperature fuse.

[0005] Moreover, with the composition shown in (b) of drawing 15 , it depends for the electric contact with fuse element 3' and electrode 2' on mere physical contact, and there is a danger that generation of heat will always by the contact resistance become high temperature. Furthermore, manufacture is not easy, even if it is welding to the hole of an electrode through a fuse element end with the composition shown in (b) of drawing 15 and the junction part is electrically stable.

[0006] the manufacture which the purpose of this invention has a thin shape, and can guarantee positive energization interception -- it is in offering an easy temperature fuse.

[0007]

[Means for solving problem] As for the thin temperature fuse concerning this invention, an electrode is laminated by both sides of a tabular insulation spacer. It is the composition characterized by allotting the piece of a meltable alloy aslant to the end face of said ****-**, and welding each end of the piece of a meltable alloy to the edge of each electrode. [the full length or the welding portion of each electrode edge neighborhood to which each end of the piece of a meltable alloy is welded is projected rather than the end face of the tabular insulation spacer, or] The edge of each electrode with which each end of the piece of a meltable alloy was welded may be cut except for the piece welding part of a meltable alloy. Moreover, it is prepared at the tip of a portion at which the electrode edge was projected by the piece-like projected part, and [this piece-like projected part is made into the meltable alloy one end welding part, or] Welding of meltable alloy one end may be performed by the piece-like projected part taken at the tabular insulation spacer end face, or a crevice or notch **** may be prepared in the tabular insulation spacer end face to which the piece of a meltable alloy is allotted.

[0008] an electrode is laminated by both sides of a tabular insulation spacer, and a hole can open other thin temperature fuses concerning this invention in this layered product -- a hole -- it is the composition characterized by allotting the piece of a meltable alloy aslant to an inner circumference end face, and welding each end of this piece of a meltable alloy to the hole inner circumference edge of each electrode.

[0009]

[Mode for carrying out the invention] The form of operation of this invention is explained hereafter, referring to Drawings. Drawing 1 is Drawings in which the important section of the example concerning this invention is shown. In drawing 1 , 1 is a tabular insulation spacer. 2

and 2 are the electrodes laminated to both sides of the tabular insulation spacer 1, and are used as the electrode with the lead part in the example of illustration using the tip part of a band-like conductor. 3 is the piece of a meltable alloy (fuse element) aslant arranged in the end side of the tabular insulation spacer 2, and has welded each end of the piece of a meltable alloy to the edge of each electrode (as for this welding, the substance top electrode side belongs to the solid phase-liquid phase junction to which melting only of the piece of a meltable alloy is carried out, without carrying out melting). Flux is applied so that this meltable alloy may be surrounded, but illustration of this flux is omitted.

[0010] Melting of the piece of a meltable alloy is carried out by unusual generation of heat of the apparatus which it is going to protect, the operation system of this temperature fuse gets wet with a melting activation operation of flux, and this melting alloy [with a promotion operation] It conglobulates, while being pulled and divided towards the electrode portion of a meltable alloy one end welding part, and a division interval is expanded by advance of conglobulation, energization is intercepted, and it is in the melting division spherical combination money being solidified by the temperature fall of the apparatus by energization interception. In this case, as it is not restricted to the field inside the inside line of an electrode like [in the case of the conventional example which conglobulation of (1) above shows to drawing 16] and is shown in (b) of drawing 1 Since it spreads also on the outside beyond this inside line a-a (this spread space is secured to the space concerned by melting of Flach made to **** beforehand), the swelling cost b to an inner side [line / inside] can be made so small. Moreover, since the piece of (2) meltable alloy is arranged aslant, and the center of the conglobulation solidification of an up-and-down melting division alloy is between the upper and lower sides and is shifted by the transverse direction, the insulation after division is guaranteed in the distance c between the tip of the inner side swelling of one conglobulation solidification alloy, and the electrode edge of another side. This distance c can be lengthened at **** compared with distance c' in the conventional example shown in drawing 16 for (1). Therefore, in the temperature fuse concerning this invention shown in (**) of drawing 1 , by the above (1) and (2), even if it makes thickness of the tabular insulation spacer 1 thin, the insulation after division of the piece 3 of a meltable alloy can fully be guaranteed, the tabular insulation spacer 1 can be made thin, and thin shape-ization of a temperature fuse can be attained.

[0011] Although a pair of band-like conductors are made to have countered in the length direction in the above-mentioned example As shown in drawing 2 , a pair of band-like conductors 20 and 20 are allotted in parallel up and down. The tabular insulation spacer 1 may be laminated between the tip parts of these band-like conductor, the piece 3 of a meltable alloy may be allotted to the end side of the tabular insulation spacer 1 in the direction of slant, each meltable alloy one end may be welded to the edge of each electrode 2, and flux may be applied to the piece of a meltable alloy (illustration of flux is omitted in drawing 2). Moreover,

the tip part of a pair of band-like conductors may be made to cross, a tabular insulation spacer may be laminated among these tip parts, the piece of a meltable alloy may be allotted to the end side of a tabular insulation spacer in the direction of slant, each meltable alloy one end may be welded to the edge of each electrode, and flux may be applied to the piece of a meltable alloy.

[0012] Drawing 3 showed the important section of another example of this invention, made the electrode edge neighborhood 21 where meltable alloy one end is welded, and 21 project rather than the end face 11 of the tabular insulation spacer 1, and has eliminated the contact to the tabular insulation spacer end face 11 of the piece 3 of a meltable alloy. Although the two-electrodes edge neighborhood 21 and 21 are made to project, you may make only one electrode edge neighborhood 21 project in this example.

[0013] In the example shown in drawing 4 , only the electrode edge 210,210 to which meltable alloy one end is welded was made to project rather than the end face 11 of the tabular insulation spacer 1, and the contact to the tabular insulation spacer end face 11 of the piece 3 of a meltable alloy is eliminated. Although the two-electrodes edge 210,210 is made to project, you may make only one electrode edge 210 project in this example.

[0014] Since it is changed into mind in the example shown in drawing 3 and drawing 4 from the surface of a tabular insulation spacer end face in case the field during division of the piece of a meltable alloy when melting division of the piece 3 of a meltable alloy is carried out is the example of (b) of said drawing 1 and the division insulation intensity of the piece of a meltable alloy is increased. Thin-shape-izing of the tabular insulation spacer 1, therefore thin shape-ization of much more temperature fuse can be attained.

[0015] To the example shown in drawing 3 and drawing 4 , the example shown in drawing 5 and drawing 6 forms the piece-like projected part 211 for piece welding of a meltable alloy, welds meltable alloy one end to this piece-like projected part, makes the base surface product of a welding part large, and is attaining easy-ization of welding.

[0016] **-** sectional view] of (b) of drawing 7 and (b) of (b) [drawing 7 shows the important section of another example of this invention. As opposed to the example of drawing 1 It is the composition to which division insulation intensity when melting division of the piece 3 of a meltable alloy is carried out is made to increase and to obtain by cutting each electrode 2 and the edge neighborhood of 2 which weld each end of the piece 3 of a meltable alloy except for the piece welding part of a meltable alloy, and lengthening the shortest distance h between the welding part w of one electrode, and the electrode 2e of another side. Therefore, thin shape-ization of much more temperature fuse can be attained by thin shape-ization of much more tabular insulation spacer. To the example shown in (**) and (**) of drawing 7 as shown to (Ha) of drawing 7 Notch Lycium chinense can do only the edge neighborhood of one electrode 2e, in this case, in contact with the end face of the tabular insulation spacer 1, the piece-like

projected part 211 can be formed in the edge of electrode 2e' of another side, and this projected part 211 can also be made it with the welding part of the piece 3 of a meltable alloy.
[0017] Drawing 8 shows the important section of another example of this invention, performs welding of meltable alloy one end to the example of drawing 7 by the piece-like projected part 211 taken to the tabular insulation spacer end face, makes the base surface product of a welding part large, and is attaining easy-ization of welding.
[0018] the above -- also in which example, although flux is applied to the piece of a meltable alloy, illustration of the flux is omitted.
[0019] In the example [examples, such as (b) of drawing 1 , drawing 2 , and drawing 7 ,] which contacts the piece of a meltable alloy to the above-mentioned tabular insulation spacer end face Notch **** 13 as shown in (b) of the crevice 12 as shown in the tabular insulation spacer end face at (b) of drawing 9 , or drawing 9 can be formed, creepage distance between divisions of the piece of a meltable alloy when melting division of the piece of a meltable alloy is carried out can be lengthened, and the insulating intensity can also be made high. According to this composition, much more thin-shape-izing of a tabular insulation spacer, therefore thin shape-ization of much more temperature fuse can be attained.
[0020] In the temperature fuse concerning this invention, the piece of a meltable alloy is protected mechanically, and in order to insulate electrically to other electric conduction contact surfaces, protection covering is usually given. For example, as shown in (b) of drawing 10 , [carry out the mold of the piece of a flux application meltable alloy by hardenability resin 41, such as an epoxy resin, or] It can close by hardenability resin 42, such as an epoxy resin, or a heat contraction tube can be covered [**** / sticking one side pressure sensitive adhesive tape] so that an up-and-down electrode and the up-and-down circumference may be surrounded, as shown in (b) of drawing 10 .
[0021] Also in which above-mentioned example, although the tip part of a band-like conductor is used for an electrode and the electrode with a lead is used, it is also possible to use the electrode 2 without a lead part and 2, as shown in drawing 11 .
[0022] Drawing 12 shows the important section of other thin temperature fuses concerning this invention, and laminates an electrode 2 and 2 to both sides of the tabular insulation spacer 1. opening a hole 5 in this layered product -- a hole -- allotting the piece 3 of a meltable alloy aslant to an inner circumference end face -- each end of this piece 3 of a meltable alloy -- each electrode 2 and the hole of 2 -- although it has welded to the inner circumference edge and is not illustrated -- a hole -- it can be filled up with flux inside and this flux restoration hole can be closed by attachment of a resin film.
[0023] the above -- also in which example, although it is considered as the one number of the piece of a meltable alloy, since current capacity is increased, as shown in drawing 13 , two pieces 3 of a meltable alloy and 3 can also be used, for example.

[0024] In order to manufacture the thin temperature fuse concerning this invention As shown in drawing 14 , superficially, separate the distance of the piece length of a meltable alloy, arrange two electrodes 2 and 2, weld the piece 3 of a meltable alloy between this plane arrangement electrode 2 and 2, and subsequently An electrode 2 and 2 can be piled up up and down on both sides of the tabular insulation spacer 1, between each electrode and a tabular insulation spacer can be adhered by adhesives, weld, etc., flux can be further applied to the piece of a meltable alloy, and protection covering can be given.

[0025] In this invention, [the above-mentioned tabular insulation spacer] A plastic film 100 micrometers - about 500 micrometers thick For example, polyethylene terephthalate, polyamide, polyimide, Poly butylene terephthalate, polyphenylene oxide, polyethylene sulfide, Engineering plastics, such as poly SARUHON, the Horia ****-**, Polycarbonate, poly phenylene sulphide, polyoxy BENZOIRU, Engineering plastics and polyvinyl chloride, such as poly ether ether RETON and poly ether IMIDO, Polyvinyl acetate, poly methyl methacrylate, a polyvinylidene chloride, The films (EVA, AS resin, ABS resin, eye ******-, AAS resin, ACS resin, etc.) or ceramic sheet of poly tetrafluoro ethylene, an ethylene poly tetrafluoro ethylene copolymer, and an ethylene-vinyl acetate copolymer can be used.

[0026] The thing which twist the metal which could use nickel 50 micrometers - about 300 micrometers thick, copper, and stainless steel foil for the above-mentioned electrode, and was excellent in weldability with the piece of a meltable alloy to plating or a clad and to decode is desirable. When a tabular insulation spacer is Ceramics Sub-Division, adhesives, meta-RAIZU soldering, etc. can perform adherence between this electrode and the above-mentioned tabular insulation spacer, and when a tabular insulation spacer is a plastic, adhesives, welding, etc. can perform it.

[0027] The alloy 80 degrees C - 120 degrees C, and whose liquid phase line temperature solid phase line temperature is 80 degrees C - 120 degrees C at the above-mentioned piece of a meltable alloy, For example, the alloy of 30 to 75 weight % of In(s), 5 to 50 weight % of Sn(s), and 0.5 to 25 weight % of Cd(s), Furthermore, the alloy which added one sort in Au, Ag, Cu, aluminum, and Bi, or two sorts or more a total of 0.1 to 5weight % to this alloy composition, The alloy of the alloy of 48 to 53 weight % of Bi(s), 28 to 33 weight % of Pb(s), and 13 to 19 weight % of Sn(s), 0.5 to 4 weight % of In(s), 50 to 54 weight % of Bi(s), 30 to 34 weight % of Pb(s), and 14 to 18 weight % of Sn(s) etc. can be used. The cross-sectional size is made into a 500 micrometers phi-50 micrometerphi grade, and, in the case of a wire, the flat line of this and this cross-section area can also be used for it. In thin temperature HIYUZU concerning this invention A heating element, for example, membrane resistance, can be prepared near the piece of a meltable alloy, energization generation of heat of this heating element can be carried out at the time of the abnormalities of apparatus, and the piece of a meltable alloy can also be made to blow out. Solid phase line temperature the above-mentioned meltable alloy

and besides it In this case, 220 degrees C - 240 degrees C, 95 to 96 weight % of alloys whose liquid phase line temperature is 220 degrees C - 240 degrees C, for example, Sn, The alloy of the alloy of 5 to 4 weight % of Ag(s), 95 to 97 weight % of Sn(s), and 5 to 3 weight % of Sb(s), Moreover, the alloy 280 degrees C - 310 degrees C, and whose liquid phase line temperature solid phase line temperature is 280 degrees C - 310 degrees C, For example, the alloy of the alloy of 92.5 to 97.5 weight % of Pb(s), 2.5 to 1.5 weight % of Ag(s), and 5 to 1 weight % of Sn (s), 90 to 93 weight % of Pb(s), 5 to 4.7 weight % of In(s), and 5 to 2.3 weight % of Ag(s) etc. can be used.

[0028] What added the chloride salt of JIECHIRU amine, the hydrobromic acid salt of JIECHIRU amine, etc. in natural rosin, denaturation rosin (**** rosin, disproportionation rosin, polymerization rosin, etc.), and these refining rosin can be used for the above-mentioned flux.

[0029]

[Effect of the Invention] [the thin temperature fuse concerning Claim 1 of this invention, or 8] The electrode edge is made into a welding point for the piece of a meltable alloy inter-electrode [which was laminated on both sides of the tabular insulation spacer]. And are between the upper and lower sides, can shift the point welding [both] horizontally, have welded, and a division melting alloy when melting division of the piece of a meltable alloy is carried out conglobulates over the outside and inner side of an electrode. Compared with the case (in the case of drawing 16) where it is restrained by only the conglobulation to an inner side, projection to the electrode inner side of division spherical combination money can be made so small. And since the insulation distance after dividing for a gap in the transverse direction of said both welding parts is given between the projection tip inside [electrode] the division spherical combination money of one electrode edge, and the electrode edge of another side, insulating intensity during division of the piece of a meltable alloy can be made higher than the conventional example (drawing 15). Moreover, with the thin temperature fuse concerning Claim 2 of this invention, or 4, since the welding electrode part is made to project from the side of a tabular insulation spacer, insulating intensity during division of the piece of a meltable alloy can be made higher than the conventional example. Moreover, with the thin temperature fuse concerning Claim 3 of this invention, or 5, since the shortest distance which cuts an electrode and results in the electrode of the meltable alloy welding part of the electrode of 1 and another side is lengthened, insulating intensity during division of the piece of a meltable alloy can be made higher than the conventional example. Therefore, with the temperature fuse concerning this invention, whether it narrows some up-and-down intervals of a welding part or makes some tabular insulation spacers thin, division insulation intensity may be made to fully hold and thin shape-ization of a temperature fuse can be attained by thinning of a tabular insulation spacer.

[Brief Description of the Drawings]

[Drawing 1] (b) of the Drawings which (b) of drawing 1 shows the important section of one example of this invention, and drawing 1 is the Drawings for explaining the operation state of the example.

[Drawing 2] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 3] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 4] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 5] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 6] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 7] (**) of the Drawings to which (**) of drawing 7 indicates the important section of another example to be the above of this invention, and drawing 7 are a **-** sectional view in (**) of drawing 7 , and Drawings to which (Ha) of drawing 7 indicates the important section of still more nearly another example to be the above.

[Drawing 8] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 9] They are the Drawings in which the example from which the tabular insulation spacer used in this invention differs is shown.

[Drawing 10] They are the Drawings in which the protection covering structure where the temperature fuses concerning this invention differ is shown.

[Drawing 11] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 12] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 13] They are the Drawings to which the important section of another example is indicated to be the above of this invention.

[Drawing 14] They are the Drawings which manufacture the temperature fuse concerning this invention and in which law is shown on the other hand.

[Drawing 15] They are the Drawings in which the conventional example from which a thin current fuse differs is shown.

[Drawing 16] They are the Drawings in which the operation state of the formal temperature

fuse of the same composition as said thin current fuse is shown.

[Explanations of letters or numerals]

1 Electrode

2 Tabular Insulation Spacer

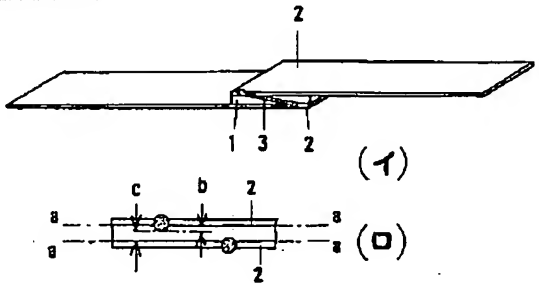
3 Piece of Meltable Alloy

21 Electrode Edge Neighborhood

210 Electrode Edge Pushing-Out Part

211 ******

[Drawing 1]



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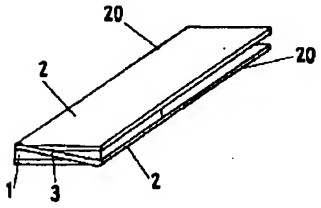

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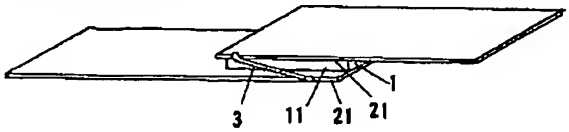

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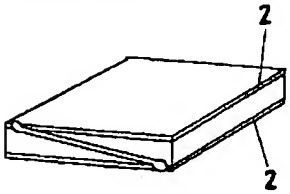

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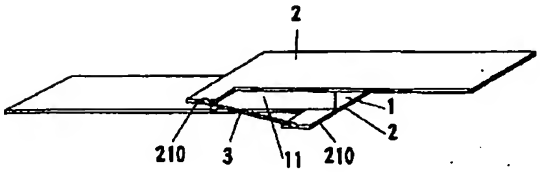

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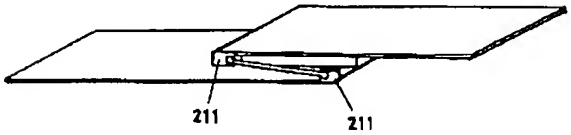

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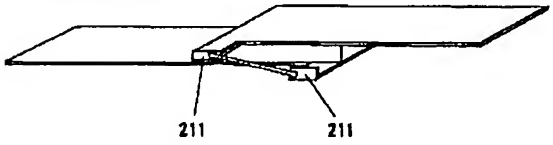

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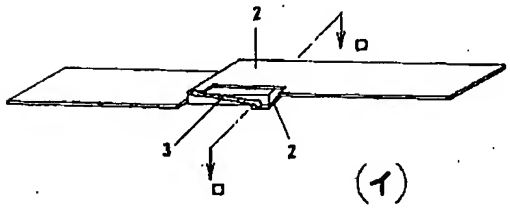

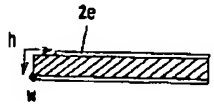

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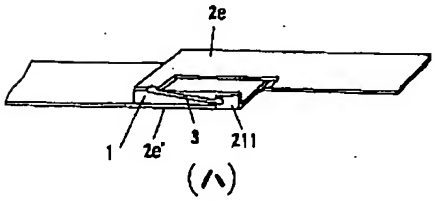

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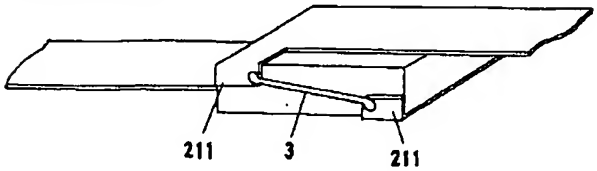
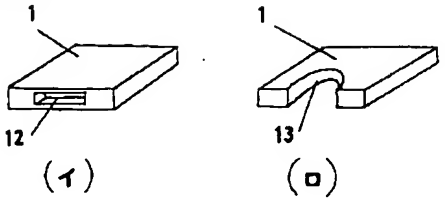
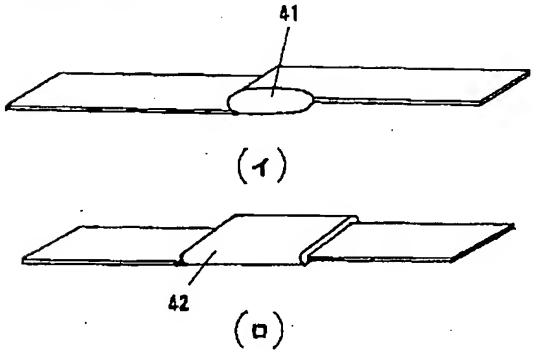


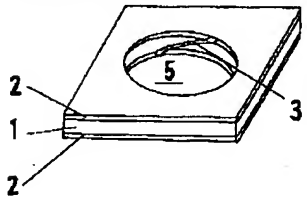
[Drawing 9]



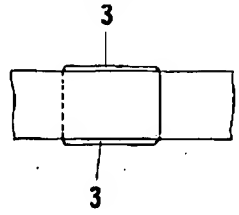
[Drawing 10]



[Drawing 12]



[Drawing 13]



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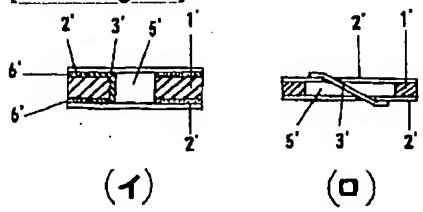

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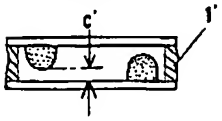

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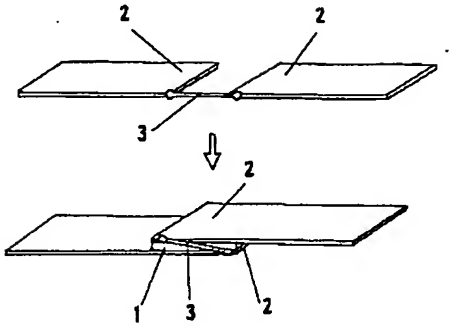

[Translation done.]

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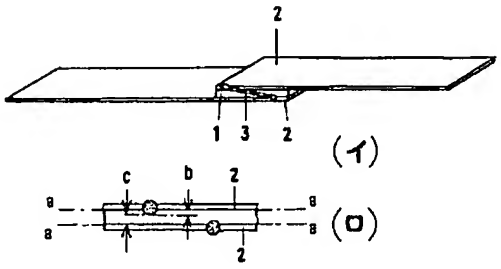
(54)【発明の名称】　薄型温度ヒューズ

(57)【要約】
【課題】薄型で、かつ確実な通電遮断を保証できる製作容易な温度ヒューズを提供する。
【解決手段】板状絶縁スペーサ１の両面に電極２，２が積層され、前記スペーサ１の端面に斜めに可溶合金片３が配され、その可溶合金片３の各端が各電極２の縁端に溶接されている。



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【特許請求の範囲】

【請求項1】板状絶縁スペーサの両面に電極が積層され、前記スペーサの端面に斜めに可溶合金片が配され、その可溶合金片の各端が各電極の縁端に溶接されていることを特徴とする薄型温度ヒューズ。

【請求項2】可溶合金片の各端が溶接される各電極縁端辺の全長または溶接箇所が板状絶縁スペーサの端面よりも突き出されている請求項1記載の薄型温度ヒューズ。

【請求項3】可溶合金片の各端が溶接される各電極の縁端が可溶合金片溶接部を除いて欠切されている請求項1記載の薄型温度ヒューズ。

【請求項4】電極縁端の突き出された部分の先端に駒状突部が設けられ、該駒状突部が可溶合金片端溶接箇所とされている請求項2記載の薄型温度ヒューズ。

【請求項5】可溶合金片端の溶接が板状絶縁スペーサ端面に取り合わされた駒状突部で行われている請求項3記載の薄型温度ヒューズ。

【請求項6】可溶合金片が配される板状絶縁スペーサ端面に凹部または切欠き部が設けられている請求項1または3あるいは5記載の薄型温度ヒューズ。

【請求項7】帯状導体の先端部が電極として使用されている請求項1～6何れか記載の薄型温度ヒューズ。

【請求項8】板状絶縁スペーサの両面に電極が積層され、該積層体に孔が開けられ、孔内周端面に可溶合金片が斜めに配され、該可溶合金片の各端が各電極の孔内周縁端に溶接されていることを特徴とする薄型温度ヒューズ。

【請求項9】通電発熱によって可溶合金片を溶断させる発熱体を有する請求項1乃至8何れか記載の薄型温度ヒューズ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は薄型温度ヒューズに関するものである。

【0002】

【従来の技術】携帯式電子機器の電源に用いられている二次電池、特にリチウムイオン二次電池においては、内蔵エネルギーが大きいために、短絡時等に異常発熱して爆発する危険性がある。而るに、かかる危険を電流ヒューズで防止すると、その異常時の電流が比較的低いために、迅速な電流遮断が難しいことが多く、温度ヒューズを使用することがある。而して、携帯電子機器の小型化、二次電池の小型化に伴い、温度ヒューズの薄型化が要求されている。

【0003】従来、薄型電流ヒューズとして、図15の（イ）に示すように、板状絶縁スペーサ1'に孔5'を開け、ヒューズエレメント3'を孔を通して板状絶縁スペーサ1'の両面に当接し、板状絶縁スペーサ両面に電極2'，2'を接着剤6'により固定したもの（特開平6-333493号公報）、図15の（ロ）に示すように、環状絶縁スペーサ1'の中央空間にヒューズエレメント3'を斜めに配し、そのスペーサ1'の両面に電極2'，2'を接着剤により固定すると共にヒューズエレメント3'の各端部を各電極2'，2'の孔を通し引出して溶接したもの（実開昭50-60530号公報）が公知である。

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【0004】

【発明が解決しようとする課題】温度ヒューズのヒューズエレメントの溶断機構は、機器の異常発熱によりヒューズエレメント（可溶合金片）が溶融され、その溶融合金がフラックスの溶融活性化や濡れ性促進作用により球状化分断され、電流遮断による機器の降温でその溶融分断合金が球面状で凝固されることにあり、電流ヒューズとは異なりューズエレメントが溶融飛散されることがない。而るに、図15の（イ）や（ロ）に示す薄型電流ヒューズと形式的に同じ構成の温度ヒューズを想定すると、図16に示すように電極2'の内面に分断溶融合金が半球状で凝固されることになるから、絶縁スペーサ1'を余り薄くすると、絶縁間隙c'が小さくなり、確実な通電遮断が困難になる。図15の（イ）の構成では、最悪の場合、間隙が零になって電流遮断が不可となる。従って、絶縁スペーサをかなり厚くする必要があり、温度ヒューズの薄型化に不利である。

【0005】また、図15の（イ）に示す構成では、ヒューズエレメント3'と電極2'との電気的接触を単なる物理的接触に依存しており、その接触抵抗による常時発熱が高温になる危険性がある。更に、図15の（ロ）に示す構成では、ヒューズエレメント端を電極の孔に通して溶接しており、その接合箇所が電気的に安定であっても、製作が容易ではない。

【0006】本発明の目的は、薄型で、かつ確実な通電遮断を保証できる製作容易な温度ヒューズを提供することにある。

【0007】

【課題を解決するための手段】本発明に係る薄型温度ヒューズは、板状絶縁スペーサの両面に電極が積層され、前記スペーサの端面に斜めに可溶合金片が配され、その可溶合金片の各端が各電極の縁端に溶接されていることを特徴とする構成であり、可溶合金片の各端が溶接される各電極縁端辺の全長または溶接部分が板状絶縁スペーサの端面よりも突き出されていたり、可溶合金片の各端が溶接された各電極の縁端が可溶合金片溶接部を除いて欠切されていてもよく、また電極縁端の突き出された部分の先端に駒状突部が設けられ、該駒状突部が可溶合金片端溶接箇所とされていたり、可溶合金片端の溶接が板状絶縁スペーサ端面に取り合わされた駒状突部で行われていたり、可溶合金片が配される板状絶縁スペーサ端面に凹部または切欠き部が設けられていてもよい。

【0008】本発明に係る他の薄型温度ヒューズは、板状絶縁スペーサの両面に電極が積層され、該積層体に孔

が開けられ、孔内周端面に可溶合金片が斜めに配され、該可溶合金片の各端が各電極の孔内周縁端に溶接されていることを特徴とする構成である。

【0009】

【発明の実施の形態】以下、図面を参照しつつ本発明の実施の形態について説明する。図1は本発明に係る実施例の要部を示す図面である。図1において、1は板状絶縁スペーサである。2，2は板状絶縁スペーサ1の両面に積層した電極であり、図示の例では、帯状導体の先端部を電極に使用しリード部付きとしてある。3は板状絶縁スペーサ2の一端面に斜めに配設した可溶合金片（ヒューズエレメント）であり、可溶合金片の各端を各電極の縁端に溶接してある（この溶接は、実質上電極側は溶融されずに可溶合金片のみが溶融される固相－液相接合に属する）。この可溶合金を包囲するようにフラックスを塗布してあるが、このフラックスの図示は省略してある。

【0010】この温度ヒューズの作動機構は、保護しようとする機器の異常発熱により可溶合金片が溶融され、この溶融合金がフラックスの溶融活性化作用と濡れ促進作用により、可溶合金片端溶接箇所の電極部分に向け引っ張られて分断されると共に球状化され、球状化の進行により分断間隔が拡大されて通電が遮断され、通電遮断による機器の降温でその溶融分断球状化合金が凝固されることにある。この場合、（1）上記の球状化が図16に示す従来例の場合のように電極の内面ラインよりも内側の領域に限られることがなく、図1の（ロ）に示すように、この内面ラインa－aを越えた外側にも広がるから（この広がりスペースは、当該スペースに予め占積させたフラックの溶融により確保される）、内面ラインよりも内側への膨らみ代bをそれだけ小さくできる。また、（2）可溶合金片を斜めに配設して上下の溶融分断合金の球状化凝固の中心が上下間で横方向にずらされるから、分断後の絶縁が一方の球状化凝固合金の内側膨らみの先端と他方の電極縁端との間の距離cで保証される。而るに、この距離cを（1）のために、図16に示す従来例での距離c'に較べ長くできる。従って、図1の（イ）に示した本発明に係る温度ヒューズにおいては、上記（1）と（2）とにより、板状絶縁スペーサ1の厚みを薄くしても、可溶合金片3の分断後の絶縁を充分に保証でき、板状絶縁スペーサ1を薄くして温度ヒューズの薄型化を図ることができる。

【0011】上記の実施例では、一対の帯状導体を長さ方向に対向させてあるが、図2に示すように、一対の帯状導体20，20を上下に並行に配し、これら帯状導体の先端部間に板状絶縁スペーサ1を積層し、板状絶縁スペーサ1の一端面に可溶合金片3を斜め方向に配し、各可溶合金片端を各電極2の縁端に溶接し、その可溶合金片にフラックスを塗布してもよい（図2では、フラックスの図示を省略してある）。また、一対の帯状導体の先端部をクロスさせ、これらの先端部間に板状絶縁スペーサを積層し、板状絶縁スペーサの一端面に可溶合金片を斜め方向に配し、各可溶合金片端を各電極の縁端に溶接し、その可溶合金片にフラックスを塗布してもよい。

【0012】図3は本発明の別実施例の要部を示し、可溶合金片端が溶接される電極縁端辺21、21を板状絶縁スペーサ1の端面11よりも突き出させて可溶合金片3の板状絶縁スペーサ端面11への接触を排除している。この実施例では、両電極縁端辺21，21を突き出させているが、一方の電極縁端辺21のみを突き出させてもよい。

【0013】図4に示す実施例では、可溶合金片端が溶接される電極縁端部210，210のみを板状絶縁スペーサ1の端面11よりも突き出させて可溶合金片3の板状絶縁スペーサ端面11への接触を排除している。この実施例では、両電極縁端部210，210を突き出させているが、一方の電極縁端部210のみを突き出させてもよい。

【0014】図3及び図4に示す実施例においては、可溶合金片3が溶融分断されたときの可溶合金片の分断間のフィールドが前記図1の（イ）の実施例の場合の板状絶縁スペーサ端面の沿面から気中に変えられて可溶合金片の分断間絶縁強度が増加されるので、板状絶縁スペーサ1の薄型化、従って一層の温度ヒューズの薄型化を図ることができる。

【0015】図5及び図6に示す実施例は、図3及び図4に示す実施例に対し、可溶合金片溶接用の駒状突部211を設け、この駒状突部に可溶合金片端を溶接し、溶接部のベース面積を広くして溶接の容易化を図っている。

【0016】図7の（イ）及び（ロ）〔図7の（イ）のロ－ロ断面図〕は本発明の別実施例の要部を示し、図1の実施例に対し、可溶合金片3の各端を溶接する各電極2，2の縁端辺を可溶合金片溶接箇所を除いて欠切して一方の電極の溶接箇所wと他方の電極2eとの間の最短距離hを長くすることによって可溶合金片3が溶融分断されたときの分断間絶縁強度を増加させる得る構成である。従って、一層の板状絶縁スペーサの薄型化により一層の温度ヒューズの薄型化を図ることができる。図7の（イ）及び（ロ）に示す実施例に対し、図7の（ハ）に示すように、一方の電極2eの縁端辺のみを欠切くこともでき、この場合、他方の電極2e'の縁端に、板状絶縁スペーサ1の端面に接して駒状突部211を設け、この突部211を可溶合金片3の溶接個所とすることもできる。

【0017】図8は本発明の別実施例の要部を示し、図7の実施例に対し、可溶合金片端の溶接を板状絶縁スペーサ端面に取り合わした駒状突部211で行ない溶接部のベース面積を広くして溶接の容易化を図っている。

【0018】上記何れの実施例においても、可溶合金片

にフラックスを塗布しているが、そのフラックスの図示は省略してある。

【００１９】上記板状絶縁スペーサ端面に可溶合金片を接触させる実施例〔図1の（イ）、図2、図7等の実施例〕においては、その板状絶縁スペーサ端面に図9の（イ）に示すような凹部１２や図9の（ロ）に示すような切欠き部１３を設け、可溶合金片が溶融分断されたときの可溶合金片の分断間沿面距離を長くしてその絶縁強度を高くすることもできる。この構成によれば、一層の板状絶縁スペーサの薄型化、従って一層の温度ヒューズの薄型化を図ることができる。

【００２０】本発明に係る温度ヒューズにおいては、可溶合金片を機械的に保護し、他の導電接触面に対し電気的に絶縁するために通常保護被覆が施される。例えば、図１０の（イ）に示すように、フラックス塗布可溶合金片をエポキシ樹脂等の硬化性樹脂４１でモールドしたり、片面粘着テープを貼着したり、図１０の（ロ）に示すように上下の電極及び周囲を包囲するようにエポキシ樹脂等の硬化性樹脂４２で封止したり、或いは熱収縮チューブを被覆することができる。

【００２１】上記の何れの実施例においても、帯状導体の先端部を電極に用いてリード付き電極を使用しているが、図１１に示すようにリード部なしの電極２，２を用いることも可能である。

【００２２】図１２は本発明に係る他の薄型温度ヒューズの要部を示し、板状絶縁スペーサ１の両面に電極２，２を積層し、該積層体に孔５を開け、孔内周端面に可溶合金片３を斜めに配し、該可溶合金片３の各端を各電極２，２の孔内周縁端に溶接してあり、図示されていないが、孔内にフラックスを充填し、このフラックス充填孔を樹脂フィルムの貼着で封止することができる。

【００２３】上記何れの実施例においても、可溶合金片の個数を一個としているが、電流容量を増すために、例えば、図１３に示すように、２個の可溶合金片３，３を使用することもできる。

【００２４】本発明に係る薄型温度ヒューズを製造するには、図１４に示すように、２個の電極２，２を平面的に、かつ可溶合金片長さの距離を隔てて配置し、この平面配置電極２，２間に可溶合金片３を溶接し、次いで、電極２，２を板状絶縁スペーサ１を挟んで上下に重ね、各電極と板状絶縁スペーサ間を接着剤、融着等により固着し、更に可溶合金片にフラックスを塗布し、保護被覆を施すことができる。

【００２５】本発明において、上記板状絶縁スペーサには、厚み１００μm～５００μm程度のプラスチックフィルム、例えば、ポリエチレンテレフタレート、ポリアミド、ポリイミド、ポリブチレンテレフタレート、ポリフェニレンオキシド、ポリエチレンサルファイド、ポリサルホン等のエンジニアリングプラスチック、ホリアセタール、ポリカーボネート、ポリフェニレンスルフィド、ポリオキシベンゾイル、ポリエーテルエーテルレトン、ポリエーテルイミド等のエンジニアリングプラスチックやポリ塩化ビニル、ポリ酢酸ビニル、ポリメチルメタクリレート、ポリ塩化ビニリデン、ポリテトラフルオロエチレン、エチレンポリテトラフルオロエチレン共重合体、エチレン酢酸ビニル共重合体（ＥＶＡ、ＡＳ樹脂、ＡＢＳ樹脂、アイオノマー、ＡＡＳ樹脂、ＡＣＳ樹脂等）のフィルムまたはセラミックスシートを使用できる。

【００２６】上記電極には、厚み５０μm～３００μm程度のニッケル、銅、ステンレス鋼箔を使用でき、可溶合金片との溶接性に優れた金属をめっき、またはクラッド等による複合化することが好ましい。この電極と上記板状絶縁スペーサとの間の固着は、板状絶縁スペーサがセラミックスの場合、接着剤、メタライズろう付け等により行うことができ、板状絶縁スペーサがプラスチックの場合、接着剤、溶着等により行うことができる。

【００２７】上記可溶合金片には、固相線温度が８０℃～１２０℃、液相線温度が８０℃～１２０℃である合金、例えばＩｎ３０～７５重量%、Ｓｎ５～５０重量%、Ｃｄ０．５～２５重量%の合金、更にこの合金組成にＡｕ、Ａｇ、Ｃｕ、Ａｌ、Ｂｉのうちの１種または２種以上を合計０．１～５重量%添加した合金、Ｂｉ４８～５３重量%、Ｐｂ２８～３３重量%、Ｓｎ１３～１９重量%の合金、Ｉｎ０．５～４重量%、Ｂｉ５０～５４重量%、Ｐｂ３０～３４重量%、Ｓｎ１４～１８重量%の合金等を使用できる。その断面寸法は、丸線の場合で、５００μmφ～５０μmφ程度とされ、これと同断面積の扁平線を使用することもできる。本発明に係わる薄型温度ヒューズにおいては、可溶合金片の近傍に発熱体、例えば膜抵抗を設け、機器の異常時にこの発熱体を通電発熱させて可溶合金片を溶断させることもでき、この場合、上記可溶合金やその外に、固相線温度が２２０℃～２４０℃、液相線温度が２２０℃～２４０℃である合金、例えばＳｎ９５～９６重量%、Ａｇ５～４重量%の合金、Ｓｎ９５～９７重量%、Ｓｂ５～３重量%の合金、また固相線温度が２８０℃～３１０℃、液相線温度が２８０℃～３１０℃である合金、例えばＰｂ９２．５～９７．５重量%、Ａｇ２．５～１．５重量%、Ｓｎ５～１重量%の合金、Ｐｂ９０～９３重量%、Ｉｎ５～４．７重量%、Ａｇ５～２．３重量%の合金等を使用できる。

【００２８】上記フラックスには、天然ロジン、変性ロジン（水添ロジン、不均化ロジン、重合ロジン等）及びこれらの精製ロジンにジエチルアミンの塩酸塩、ジエチルアミンの臭化水素酸塩等を添加したものを使用できる。

【００２９】

【発明の効果】本発明の請求項１または８に係る薄型温度ヒューズでは、板状絶縁スペーサを挟んで積層した電

極間に可溶合金片を電極縁端を溶接点とし、かつ両溶接点を上下間で横にずらせて溶接してあり、可溶合金片が溶融分断されたときの分断溶融合金が電極の外側と内側とにわたり球状化し、内側への球状化のみに制約される場合（図１６の場合）に較べ、分断球状化合金の電極内側への突出をそれだけ小さくでき、しかも前記両溶接箇所の横方向へのずれのために分断後の絶縁距離が一方の電極縁端の分断球状化合金の電極内側への突出先端と他方の電極縁端との間で与えられるから、可溶合金片の分断間の絶縁強度を従来例（図１５）よりも高くできる。また、本発明の請求項２または４に係る薄型温度ヒューズでは、溶接電極箇所を板状絶縁スペーサの側面より突き出させているから、可溶合金片の分断間の絶縁強度を従来例よりも高くできる。また、本発明の請求項３または５に係る薄型温度ヒューズでは、電極を切欠して一の電極の可溶合金溶接箇所と他方の電極に至る最短距離を長くしてあるから、可溶合金片の分断間の絶縁強度を従来例よりも高くできる。従って、本発明に係る温度ヒューズでは、溶接箇所の上下間隔を多少狭くしても、即ち板状絶縁スペーサを多少薄くしても、分断絶縁強度を充分に保持させ得、板状絶縁スペーサの薄厚化により温度ヒューズの薄型化を図ることができる。

【図面の簡単な説明】

【図１】図１の（イ）は本発明の一実施例の要部を示す図面、図１の（ロ）はその実施例の作動状態を説明するための図面である。

【図２】本発明の上記とは別の実施例の要部を示す図面である。

【図３】本発明の上記とは別の実施例の要部を示す図面である。

【図４】本発明の上記とは別の実施例の要部を示す図面である。

【図５】本発明の上記とは別の実施例の要部を示す図面である。

【図６】本発明の上記とは別の実施例の要部を示す図面である。

【図７】図７の（イ）は本発明の上記とは別の実施例の要部を示す図面、図７の（ロ）は図７の（イ）におけるロ－ロ断面図、図７の（ハ）は上記とは更に別の実施例の要部を示す図面である。

【図８】本発明の上記とは別の実施例の要部を示す図面である。

【図９】本発明において使用する板状絶縁スペーサの異なる例を示す図面である。

【図１０】本発明に係る温度ヒューズの異なる保護被覆構造を示す図面である。

【図１１】本発明の上記とは別の実施例の要部を示す図面である。

【図１２】本発明の上記とは別の実施例の要部を示す図面である。

【図１３】本発明の上記とは別の実施例の要部を示す図面である。

【図１４】本発明に係る温度ヒューズを製作する一方法を示す図面である。

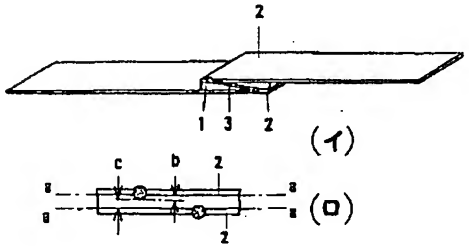
【図１５】薄型電流ヒューズの異なる従来例を示す図面である。

【図１６】前記薄型電流ヒューズと同一構成の形式的な温度ヒューズの作動状態を示す図面である。

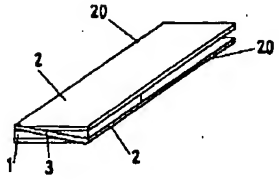
【符号の説明】

１	電極
２	板状絶縁スペーサ
３	可溶合金片
２１	電極縁端辺
２１０	電極縁端突き出し部
２１１	駒状部

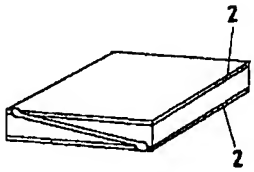
【図１】



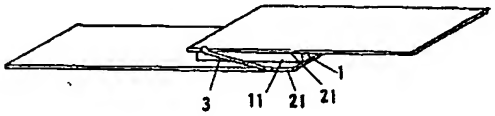
【図２】



【図１１】



【図３】



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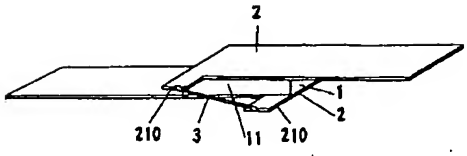
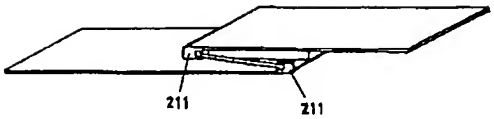
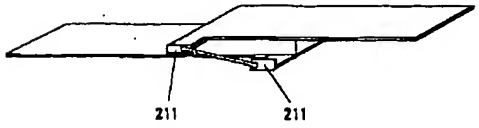


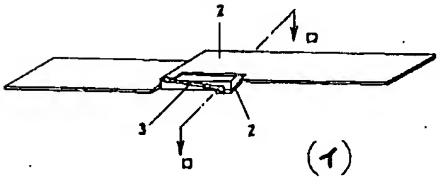
【図5】



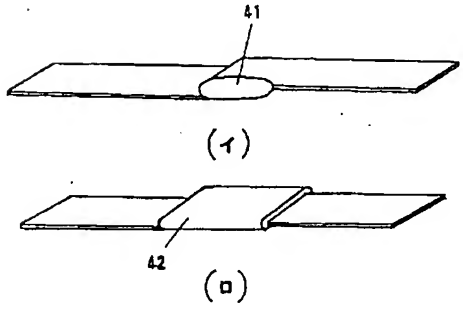
【図6】

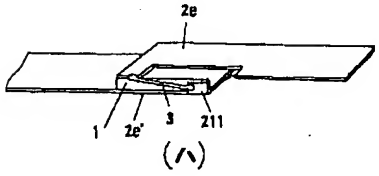


【図7】



【図10】





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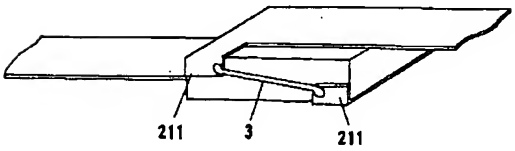

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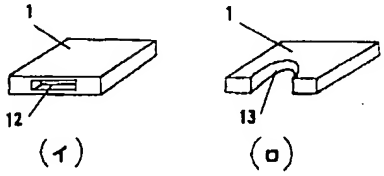
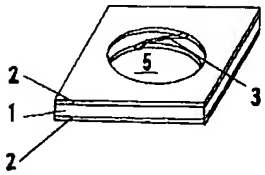
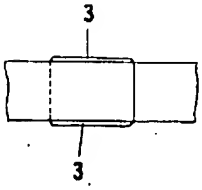


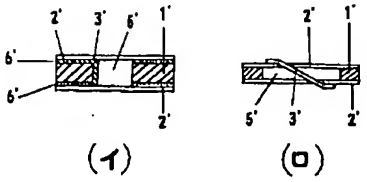
【図12】



【図13】



【図15】



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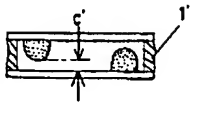

【図14】